



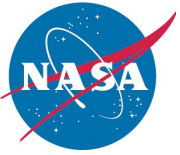
NASA Global Hawk Status

27 July 2006

Global Hawk Instruments Workshop



Chris Naftel, NASA Dryden
661-276-2149, chris.naftel@nasa.gov



Outline



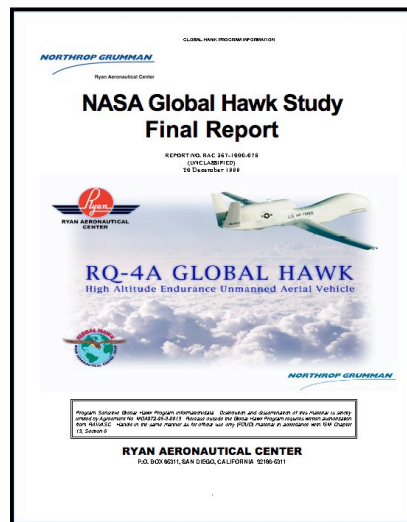
- **Opening remarks.**
- **ACTD asset transfer status.**
 - Equipment to be Transferred.
 - Timeline.
- **NASA Global Hawk Program planning status.**
 - CONOPS.
 - DFRC facilities.
 - Ground station approach.
 - Communications system approach.
 - Payload considerations.
- **Business plan development.**
 - Approach.
 - Schedule.



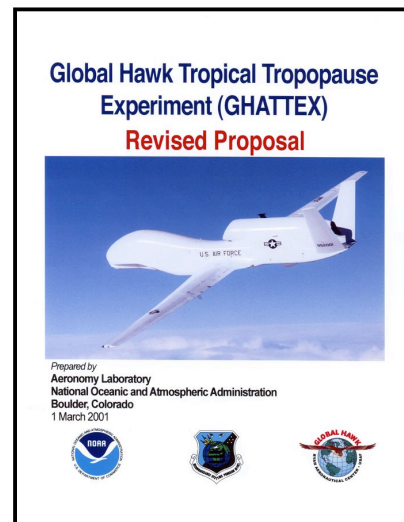
Opening Remarks



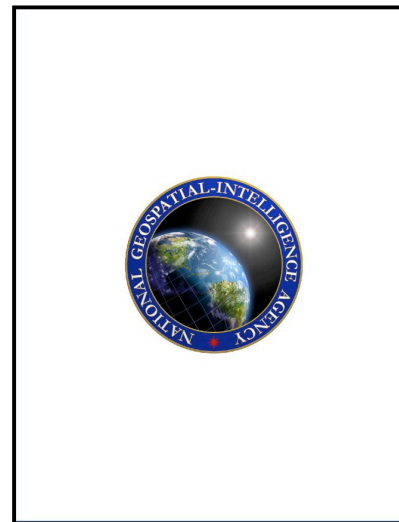
Many attempts have been made to gain access to a Global Hawk for civilian-sponsored applications.



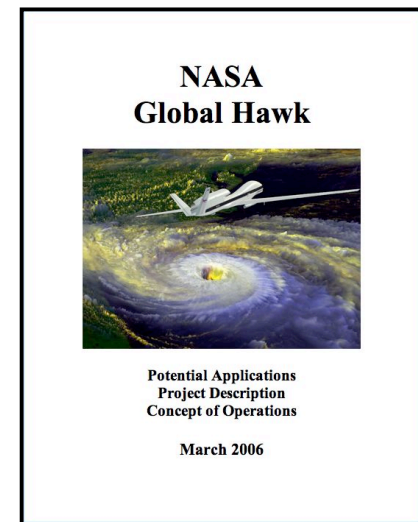
1999



2001



2003



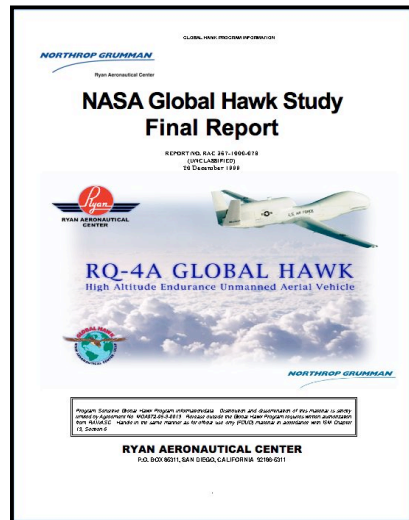
2006



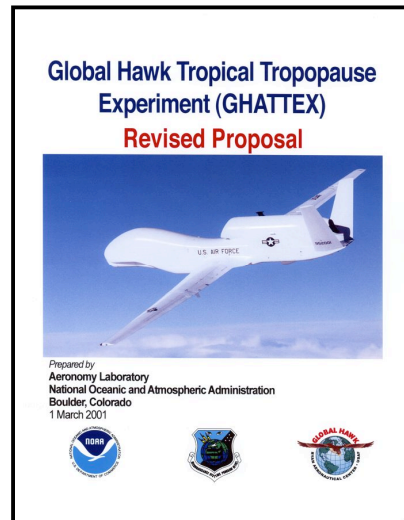
Opening Remarks



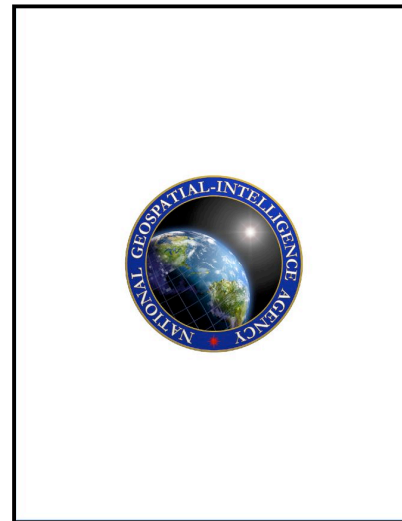
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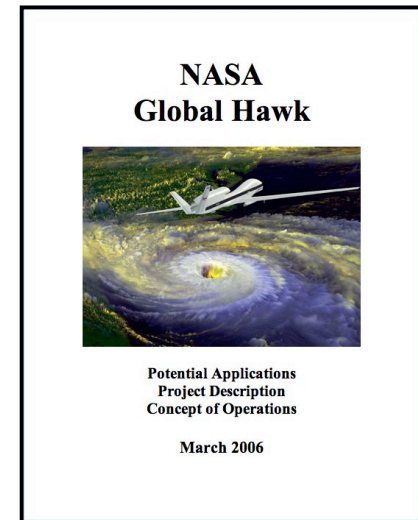
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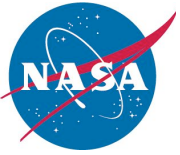


2003



2006

Now we are about to make it happen!



ACTD Asset Transfer Status





Equipment to be Transferred



- **AV-1 and AV-6.**
- **5 sets of ground segment air vehicle C2 legacy equipment.**
- **ACTD unique support equipment, spares, and documentation.**
- **ACTD Software Integration Lab (SIL) assets.**



ACTD Asset Disposition Timeline

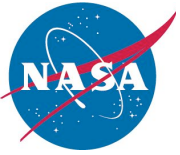


- **June 14-15: Kick-off meeting (USAF/NASA/NGC/NOAA). The group agreed on Disposition Plan content, identified issues, and assigned tasks.**
- **July 5: Randy Brown, Director GHSG, sent memo to AFMC HQ recommending ACTD asset transfer to NASA Dryden.**
- **July: First of five legacy ground segments upgraded. Remaining four will be complete by end of 2006.**
- **August: Disposition Planning complete.**
- **September 30: USAF ACTD assets transferred to DFRC, except AV-3 (USAF Museum) and NGC owned ACTD assets.**
- **October-November: AV-3 will be field stripped. AV-1,6 will be processed and inspected.**



NASA Global Hawk Planning Status





NASA / GH Planning Status



- **CONOPS**
- **DFRC Facilities**
- **Ground Station Approach**
- **Communications System Approach**
- **Payload Considerations.**



NASA/GH Planning Activity

May - October 2005



Goal

- To understand required assets, conops, schedule, and cost for standing-up a NASA Global Hawk program.

Products

- Concept of Operations (CONOPS) document.
 - Gain understanding of Global Hawk system.
 - Identify least complicated path to safely fly AV-1.
 - Investigate options for increasing vehicle and payload utility.
- Cost estimate for project start-up and routine operations.

Approach

- Established a DFRC team of discipline experts to learn the GH System.
 - Created 6 IPT's, each one led by a DFRC team member.
 - Utilized Northrop Grumman, Raytheon, L-3 Com expertise.
 - Acquired important documentation. (i.e. FOM, inventory lists..)



CONOPS Study Participants



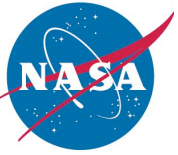
		IPT Leads
Robert Anderson	L-3 Communications	
Michael Andranovich	Northrop Grumman	
Tom Bryson	Northrop Grumman	
Tim Cox	NASA Dryden	
Dan Davis	Raytheon	
Dave Fratello	NASA Dryden, (Zeltech)	Air Vehicle
Bob Fritz	Northrop Grumman	
Laurie Grindle	NASA Dryden	IPT Integration/Business
Paul Gural	Raytheon	
Fran Holian	Northrop Grumman	
Doug Jaynes	Raytheon	
Gary Kellogg	NASA Dryden	Ground Station
Ron Lewis	Raytheon	
Greg Loegering	Northrop Grumman	
Dave McAllister	NASA Dryden	Operations
Mark McHugh	Raytheon	
John McKee	NASA Dryden	Comm Systems
Chris Naftel	NASA Dryden	Formulation Lead
Ken Norlin	NASA Dryden	
Gayle Patterson	NASA Dryden	Simulation/Mission Planning
Paul Reukauf	NASA Dryden	
Kurt Sanner	NASA Dryden	
Hank Silva	Northrop Grumman	
David Tow	NASA Dryden	
Bill Walker	Northrop Grumman	



CONOPS Approach/Assumptions

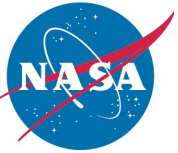


- **Combined DFRC/Contractor operations team.**
- **Crawl, walk, run approach to program stand-up.**
- **EAFB Ground Segments will be made available to DFRC on a non-interference basis.**
- **Fixed ground control station will be assembled at Dryden.**
- **Initially, base of operations will be limited to EAFB.**
- **Payload and Air Vehicle C2 will be independent.**



EAFB/DFRC Facilities





Building 4840, RAIF

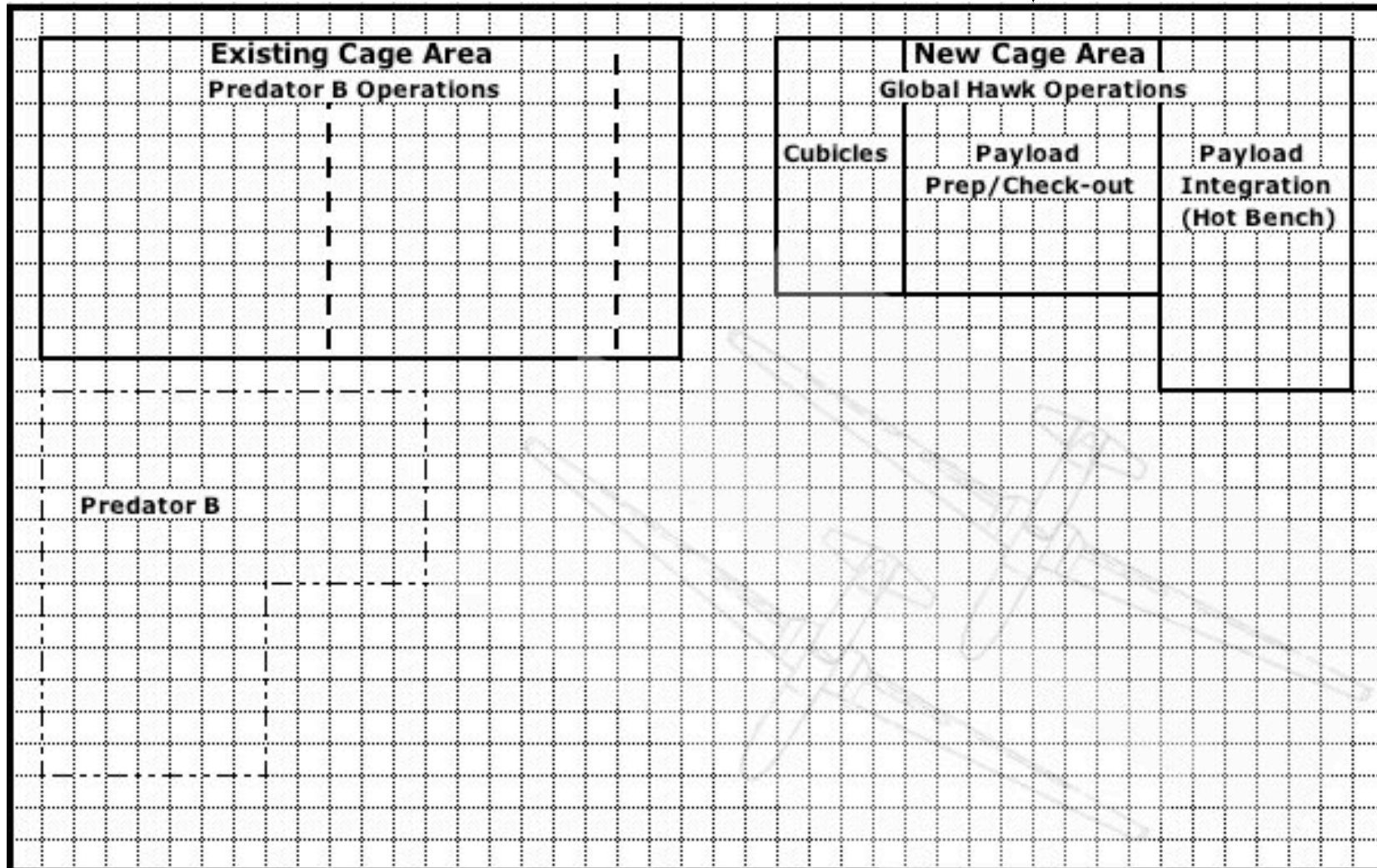




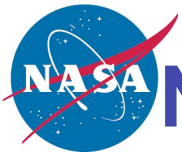
Building 4840, Test Bays 1,2,3



GCS Window



~135' x 225'



NASA Ground Station Development



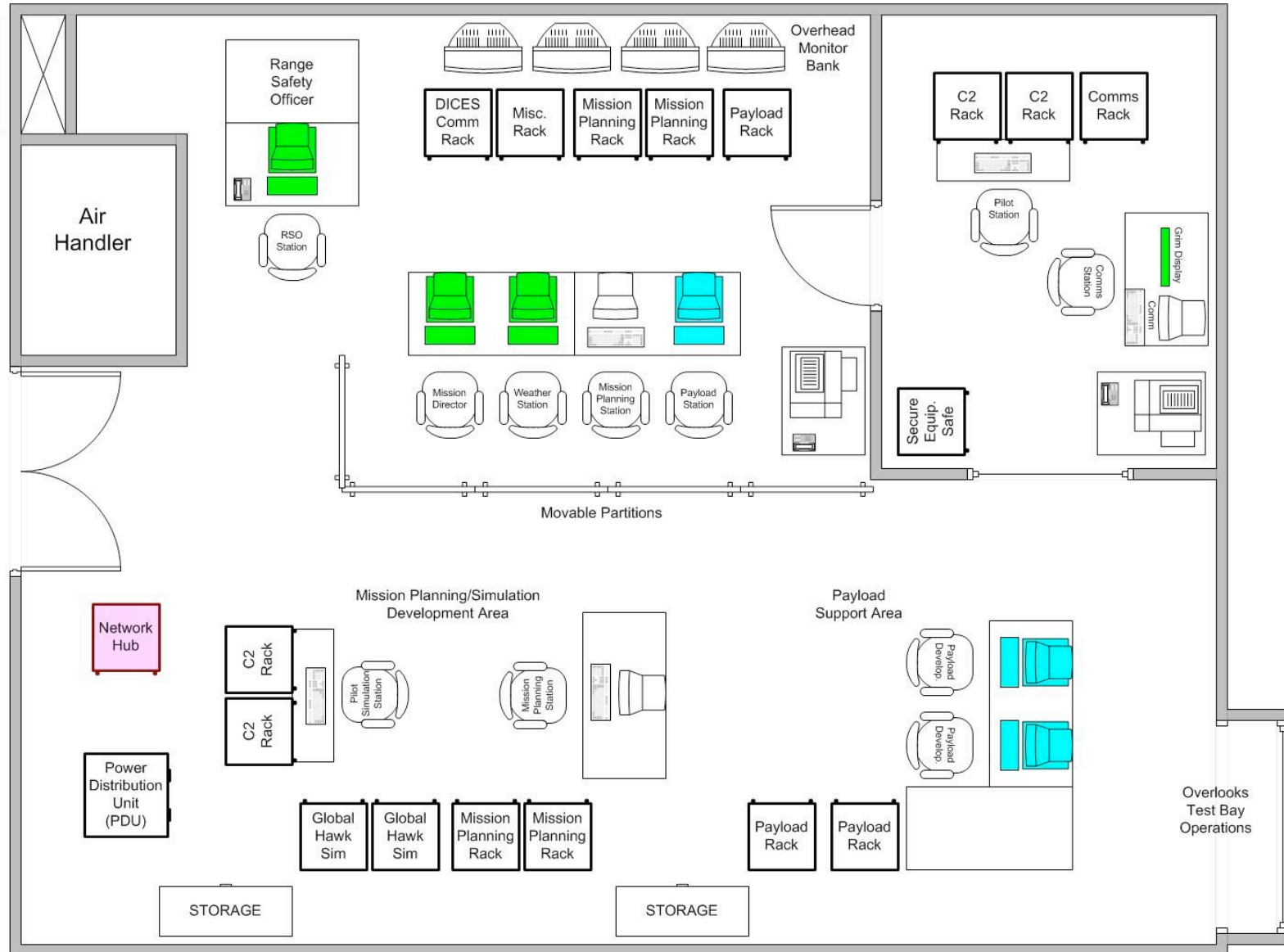
- **DFRC Ground Control Station Design Approach**
 - **Integrated Product Team.**
 - **Members:** DFRC, NGC, RFC, MTC, L-3 Communications.
 - Small core team on IPT, additional people supporting the effort as required.
 - **Scope:** Develop optimal ground station design for NASA operation of AV-1&6.
 - Design will include C2 of the air vehicle, mission planning station, and LOS and BLOS communications system.
 - AV-1&6 configuration TBD.
 - **Benefit:** Ensures the owner, builder, integrator, operator, and maintainer have influence on design.
 - Best product in the shortest amount of time.
 - **Design Options.**
 - Legacy hardware.
 - Production hardware.
 - **Schedule.**
 - Kick-off meeting/telecon – June 29.
 - Review requirements.
 - Determine roles and responsibilities.
 - Agree on schedule and deliverables.
 - Preferred design option selected July 19.
 - Regular meetings/telecons, some hosted at contractor facilities.
 - Final design should be complete in September.
- **EAFB Ground Segments**
 - All USAF ground segments are being upgraded to production level.
 - DFRC is funding the software build that allows backward compatibility with ACTD air vehicles.
 - DFRC will be allowed to use EAFB ground segments on non-interference basis.



Preliminary GCS Layout



Title: GH Layout.vsd
Author: Gary Kellogg
Date: 22 May 2006
Rev: DRAFT Option 3
Rev Date: -



~29' x 38'



Ground and Air Segment Communications Elements (Air Vehicle C2 and ATC)

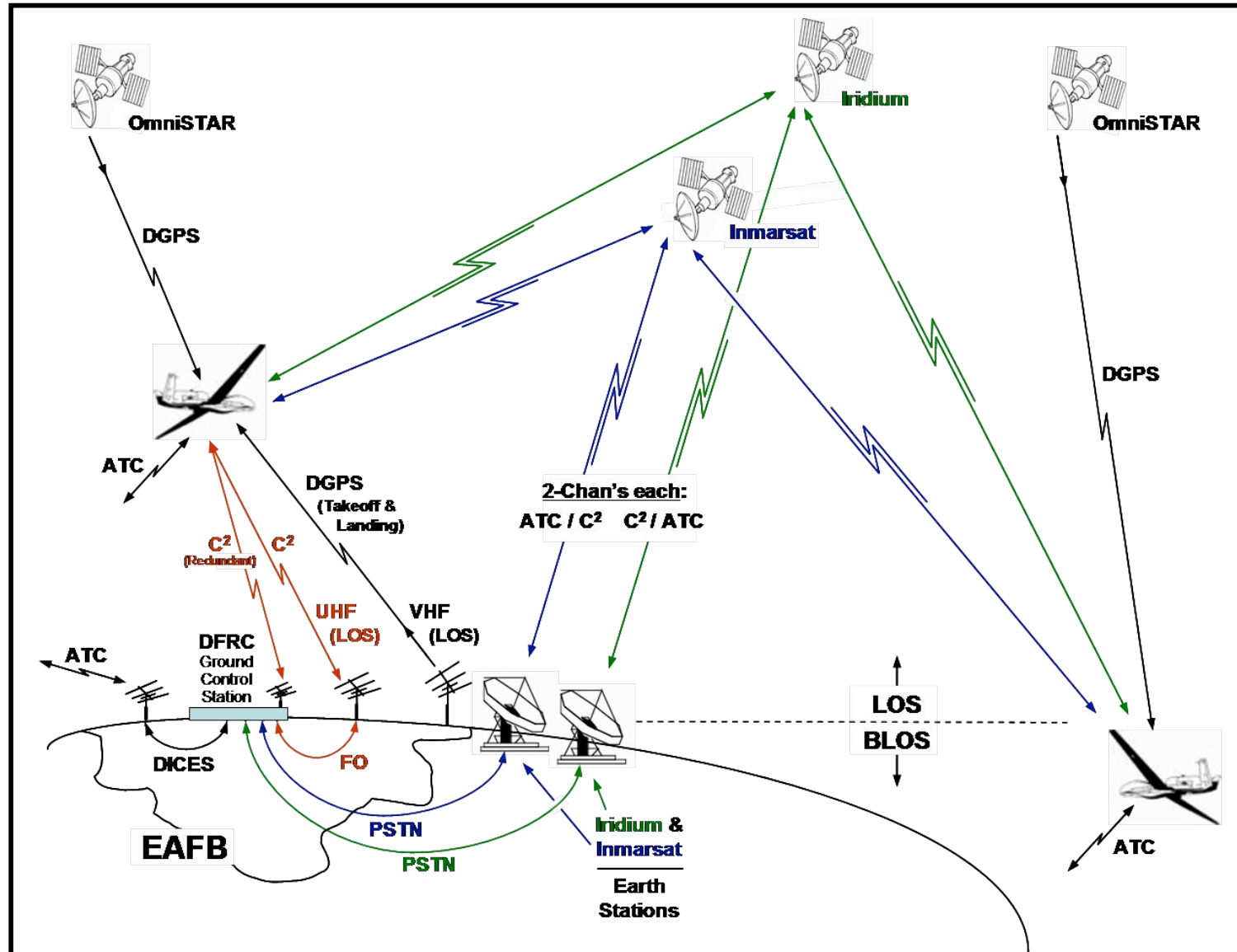


- **Ground Segment.**
 - Primary and redundant UHF LOS systems. (Antennas located at Pad 21 and on the RAIF roof.)
 - Two Inmarsat (Air vehicle C2 and ATC) and two Iridium (Air vehicle C2 and ATC) channels.
 - Existing Dryden DGPS system (VHF) used for launch and recovery.
 - Local area ATC communications through the Dryden DICES system.
- **Air Segment.**
 - UHF LOS.
 - Two Inmarsat and two Iridium channels.
 - DGPS (OmniSTAR and VHF).

Note: GCS IPT will recommend final communications architecture.



NASA Global Hawk Communications Architecture (Air Vehicle C2 and ATC)



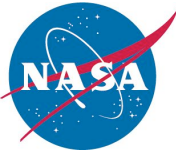
Note: GCS IPT will recommend final communications architecture.



Payload Accommodations and Integration Philosophy



- **Plug and play - standard interfaces in each payload area.**
- **Incorporate lessons learned from other projects.**
- **Solicit inputs/recommendations from the user community.**
- **Develop an experimenter's handbook similar to DC-8 and ER-2.**



Global Hawk Business Planning Status





Business Plan Development



- **Continue to refine conops and program planning.**
 - **Staffing projections.**
 - **Start-up and operations costs.**
 - **Timelines.**
 - **Pricing strategy.**
- **Engage customers and partners.**
 - **Identify potential payloads.**
 - **Solicit Letters-of-Intent, negotiate MOU's.**
- **Secure funding for program stand-up and get user commitments.**
 - **NASA Mission Directorates**
 - **NOAA**
 - **NGC**
 - **DHS**
 - **DoD**
 - **DOE**
 - **Others**

